

A CONTRIBUTION TO THE ETIOLOGY OF MALIGNANT TUMORS.

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SO much of an almost purely speculative character has been written during the last ten years on the etiology of malignant tumors that were this paper to contain merely a new hypothesis I should scarcely venture to present it to the surgical society.

It consists, however, chiefly of a series of cases, most of which have come under my own observation, which, in my judgment, strongly support that hypothesis which is slowly but surely working its way into the minds of most thinking pathologists and surgeons. I refer to the hypothesis which attributes these mysterious neoplasms to a specific virus, in all probability a micro-organism.

Without stopping to give an accurate definition of the term "tumor" in general, it may be sufficient to say that by malignant tumors we mean those that invade the neighboring tissues and produce metastases¹ and that all such tumors are included in two great classes, carcinoma and sarcoma. In regard to the first of these, almost all pathologists have accepted Waldeyer's view, that the cells which occupy the alveoli are epithelial, and the tumors, therefore, are essentially of epithelial origin; while there is no doubt whatever that the sarcomata are built up of connective tissue elements.

The theories hitherto formulated in regard to the origin of these tumors have been so well classified by Dr. H. F. Formad,² in an exhaustive paper on the same subject, that I cannot do better than reproduce this classification. Under each head-

ing he has given a list of the pathologists who have supported the hypothesis. The list is as follows :

(2). Predisposition and inflammation theory—Virchow, S. D. Gross, Woodward, Samuel, Wagner, Birch-Hirschfeld, Cornil and Ranvier, Perls, Tyson, S. W. Fitz, Gross.

(2). Dyscrasia theory—Rokitansky, Paget, Billroth, Simon.

(3). Embryonal theory—Cohnheim, Thiersch, Waldeyer, Lücke, Masse, Hasse, Epstein.

(4). Idiopathic or spontaneous—Rindfleisch, Stricker, Nancrede, Payne.

(5). Nervous theory—Van der Kolk, Lang, Snow.

The nervous theory is, I think I may safely say, too fanciful to merit discussion, except when considered as a possible predisposing cause. The idiopathic and dyscrasia theories mean nothing, the terms themselves being mere words which either confess our ignorance or serve as a cloak to hide it. Cohnheim's, or the embryonal theory, which has lately fallen into some discredit, undoubtedly offers a satisfactory explanation of the origin of some benign tumors, and may afford a beautiful explanation of one of the facts in regard to the structure of many malignant tumors apparently most difficult to reconcile with our hypothesis. For, if in certain regions, as in the parotid, embryonic remains are of frequent or constant occurrence, and in others occur rarely or not at all, we can understand why in the one case the same irritant should give us a mixed, in the other a simple tumor.

There remains, then, only the predisposition and inflammatory theory. Under the great authority of Virchow, pathologists have been ready enough to accept this last as a sufficient explanation; that they have been and are still very slow to recognize that the inflammation is of a specific kind is due, I think, chiefly to the following causes: When, following closely on his cellular pathology, it was demonstrated by Virchow that tumors consisted of cells not differing genetically from those found in normal tissues, the discovery excited such enthusiasm that many men were convinced that the life history of the cell alone could sufficiently account for all the phenomena. Thus, according to the widely accepted view of Thiersch, in old age the resistance of the connective tissue is diminished,

the interstitial spaces are widened; under some local irritation the deeper epithelial layers proliferate and penetrate the underlying tissues, penetrate the lymph spaces, and are swept into the neighboring lymphatic glands, where, in accordance with their life history, they develop indefinitely, and not being on a surface where constant desquamation can occur, must do so at the expense of surrounding tissues. Thiersch, while correctly recognizing the inflammatory character of at least one group of malignant tumors, the carcinomata, could not at that time make the distinction now clearly recognized between simple or non-infective inflammations and infective, and his followers, with less excuse, refuse to do so even now. We have many instances of local infective inflammations giving rise to metastases; not one, so far as I know, of the non-infective. The view that malignant tumors are of inflammatory origin is one which has spread widely among pathologists, especially since it has been found necessary to place the so-called granulomata, tubercle, lepra, and syphilis among the inflammatory diseases. The points of analogy between these and the malignant tumors are too numerous and obvious to have escaped observation. They have been presented at length by Dr. Formad in an exhaustive paper³ and by Dr. Nedopil.⁴ Time will only permit me to discuss them briefly to-night.

Tubercle, which may be taken as the representative of the granulomata, was long considered to be an ordinary inflammation in a tissue predisposed to disease. This is the standpoint which many pathologists occupy at present in regard to malignant disease. It is interesting to note that Formad,⁵ whose weakness for peculiarities in the lymphatic system, as sufficient to account for the origin of tubercle led him to reject the tubercle bacillus, and brought down on him what can only be described as the annihilating criticisms of Professor Koch⁶ and Dr. Shakespeare,⁷ finds in the absence of the endothelium of the lymph spaces, in carcinomata and sarcomata, a sufficient explanation of their peculiar growth.

Numerous attempts have been made to show that the anatomical peculiarities of tubercle tissue—epithelioid cells, giant cells, cheesy degeneration—are sufficient to account for all the peculiarities of the disease. The researches of Baumgarten⁸

and Weigert⁹ show that they represent only the reaction of the enfeebled cells under the irritation caused by the bacillus. A pathologist can hardly fail to be struck by the similarity of the enormously hypertrophied cells almost constantly found in sarcomata and carcinomata to the epithelioid and giant cells of tubercle, while the frequency with which they are found in a state of fatty degeneration, and the readiness with which they undergo spontaneous necrosis remind us forcibly of cheesy degeneration. The discussion is not yet quite terminated among pathologists as to whether tubercle tissue always differs so much from other inflammatory products as to make the microscopic diagnosis possible in every case. In the same way the exact line between certain sarcomata and the products of chronic inflammation has never yet been drawn, while that form of tubercular skin disease known as lupus papularis or verrucosis, commonest on the dorsum of the hand, and of undoubted inflammatory origin, is, as I have myself had occasion to observe, undistinguishable under the microscope from epithelioma¹⁰. Into what absurdities we may be led by regarding carcinoma as merely a non-specific inflammatory process is well shown by the statement of Formad¹¹ that there are great numbers of chronic ulcers of the leg in the Philadelphia hospitals, and that a large proportion of them are carcinomata—because he has found epithelial nests and proliferation of the interpapillary epithelium.

Both tuberculosis, as seen by the surgeon, and malignant tumors are distinctly associated with traumatisms. Thus Volkmann states that the great majority of tubercular bone and joint diseases are referable to an injury¹², while Formad alleges that he finds an inflammatory origin in nearly one-half of all tumors.

Dr. O. G. Zesas quotes¹³ S. Wolff's statistics drawn from tumor cases observed in the surgical clinic at Berlin between 1864 and 1873, according to which in 344 cases of carcinomata a trauma was given as the cause 42 times, and in 100 of sarcoma 20 times.

It is well known that sarcomata usually follow a single injury and carcinomata a long continued irritation. The reverse, however, is by no means unknown. Thus Weil¹⁴ gives two

cases of sarcomata attributed to repeated irritation. Dr. R. F. Weir¹⁵ has reported a case of scirrhus of the penis following a contusion received four months previously, and refers to a similar case reported by Holmes Coote¹⁶. J. W. Hulke* reported a case, occurring in a man aged 68, in which a small wound of the palate, made by the stem of a pipe driven into the mouth, was followed in a month by a small wart, which grew rapidly, and six months after extirpation recurred, extended rapidly and caused the death of the patient. Microscopic examination proved the tumor to be an epithelioma..

If we deny the existence of a specific virus in these cases we are compelled to fall back upon the vague term predisposition, which was formerly used to explain the cases of tubercular disease having a similar origin. On the hypothesis of a non-specific inflammatory origin it would be difficult to account for the fact that in some countries malignant tumors are practically unknown¹⁸. For surely contusions and chronic inflammatory processes with diminished resisting power on the part of the connective tissue can not be wholly wanting in these places. One of the strongest objections made to the assumption of a specific poison in the case of malignant diseases has been the absence of any evidence of contagion. Cohnheim¹⁸ denied the existence of a specific poison on the ground that the surgeon is never infected from his patient *or the husband from the wife*. It is well to remember that precisely the same objection was made to the tubercle bacillus. Many physicians of large experience declared that they had never seen a case of even probable tubercular infection; yet now the journals are filled with them, and while the surgeon seems still to be safe, the anatomist has not been spared¹⁸.

It is to meet this objection that I have ventured to present the following cases to the surgical society. Three of the series are from the practice of Dr. Sands, and one or both of the patients concerned in each case have come under my own observation; for the fourth I am indebted to Dr. Markoe, and the fifth was seen at the out-door department of the Roosevelt Hospital by myself.

CASE I. Mr. Thomas E. C., æt. 40, married; New York, clerk. Admitted to Roosevelt Hospital December 3, 1878. Family history good.

Patient has varicocele on the left side, and tumor of the left testicle of twenty-two months growth, the size of a cocoa nut, smooth, firm and of fibrous consistency. Extirpation of the tumor January 3, 1879, by Dr. Sands. Death January 26, from suppression of urine, due to pressure on the ureters by metastatic growths in abdominal cavity. Microscopic examination by Dr. Delafield showed the tumor of testicle and in the abdominal cavity to be encephaloid carcinoma (19).

Mr. C.'s widow subsequently married. Margaret Anne, New York City, æt. 40 years and 3 months, died while under my care, April 12, 1885, with carcinoma "*en cuirasse*," originating in the mammæ. Tumors were stated to have been first noticed in 1882, and in both breasts at the same time. The growth was confined to the mammary glands and the skin. No enlargement of the axillary glands occurred, and only superficial ulceration of the carcinoma. Death due to repeated hæmorrhages from the ulcerating surface and to exhaustion. No autopsy obtained. Mrs. I.'s mother, Mary Anne D., died January 30, 1885, æt. 81 years and 6 months, of acute bronchitis and bronchopneumonia. One month before her death the patient consulted me with regard to a rapidly growing tumor of the right breast, which she had first noticed one month previously. My diagnosis was probable carcinoma. The tumor was seen also by Dr. Sands, who concurred with me. The family history of this patient was good, especially no history of tumors. She had been a good deal with her daughter during the illness of the latter, but did not live in the same house. No autopsy obtained.

CASE II. Mrs. D., æt. 43, with good family history, was subjected to operation by Dr. Sands on May 3, 1882, for carcinoma of the right breast of one year's duration. Recurrence took place about six months later, and the patient died about April, 1883. Microscopic examination by Dr. Satterthwaite showed tumor to be scirrhus carcinoma. Mr. George D., æt. 47, husband of the last patient, came under observation on October 20, 1882, suffering from tumor of the superior maxilla. A younger brother died five years ago of what was said to be recurrent sarcoma of the testicle. Family history otherwise good. About three months ago the patient noticed a swelling in the left superior maxillary region, and thinks he noticed a hard lump beneath the left angle of the lower jaw some time before this. Both tumors have grown rapidly since. A tumor of soft consistency occupies the situation of the left superior maxilla, and extends in the direction of the malar bone. There is a mass of enlarged glands beneath the left angle of the lower jaw. Extirpation of the tumor and enlarged glands by Dr. Sands. Rapid

recurrence and death in May, 1882. Microscopic examination shows the tumor to be an epithelioma.

CASE III. Miss Isabella S., admitted to Roosevelt Hospital May 25, 1885, suffering from a rapidly growing tumor involving the right superior maxilla, and said to be of three months' duration. Extirpation of the superior maxilla by Dr. Sands May 27, 1885. Death from shock and hæmorrhage following the operation. Microscopic examination shows the tumor to be a giant celled sarcoma. Mr. F. J. G., æt. 20, single, was engaged to Miss S. for some months before her death. He was submitted to a surgical operation on September 9, 1885, by Dr. Post for the removal of a small cystic tumor of the right superior maxilla, said to be of only three weeks' duration. The tumor lay in front of the antrum and did not occupy its cavity. Microscopic examination showed the tumor to be a giant-celled sarcoma.

CASE IV. Taken from Dr. Markoe's work on Diseases of Bones, p. 266, 1872. Mrs. S. N. E., æt. about 23, consulted Dr. Markoe March 26, 1866, for a small tumor occupying the right side of the neck, behind the sterno-mastoid, and about the size of a hickory nut. Operation May 1, 1866, when tumor was found closely attached to the transverse process of the fourth cervical vertebra. Recurrence after a few months, and slow growth until April 10, 1869, when a second operation was performed. Recurrence in fall of 1869, with gradually increasing paralysis due to pressure on spinal cord. Third operation on January 25, 1871, followed by complete relief of all the symptoms and no recurrence up to the present time. Microscopic examination by Dr. Delafield showed the tumor to be a myxo-sarcoma.

Mr. E., æt. 56, husband of the last patient, underwent on January 19, 1885, an exploratory incision of the abdomen to determine the nature of an abdominal tumor, the symptoms of which dated from December, 1884. A soft, friable tumor was found matting the viscera together in such a way as to prevent the possibility of its removal. The tumor was considered by Dr. Markoe to be sarcoma, probably originating in the great omentum. The patient died about three days after the operation. No autopsy was obtained.

CASE V. Thomas C., New York, æt. 53, September 4, 1885; family and personal history good, especially no history of tumors or syphilis. Sixteen years ago the patient broke his left arm near the elbow, but recovered without stiffness or deformity. One month ago the left elbow and the right ankle became swollen, and swelling has increased rapidly since, without pain, redness or tenderness, except over the internal malleolus, where the pain is quite severe. Examination shows

that the inferior extremities of the left humerus and the right tibia are expanded so as to form distinct tumors, being smooth and of bony hardness. The neighboring bones and articulations are unaffected. Diagnosis of simultaneous sarcoma of the humerus and tibia. The patient was examined by a number of surgeons, who all concurred in the diagnosis. The tumors were especially unlike in their growth and character, syphilitic or tubercular deposits, which almost alone might be supposed to come into consideration.

While taking the patient's history, I incidentally elicited the fact that his wife had died last February, after a six weeks' illness, with rapidly advancing hemiplegia of the left side, and that the diagnosis of the attending physician, Dr. A. R. Robinson, of this city, was tumor of the brain. Dr. Robinson, whose well-known skill as a pathologist lends weight to the diagnosis, informs me that the case was a well-marked one of rapidly growing tumor of the brain involving the motor areas about the fissure of Rolando, and so far as the diagnosis could be made clinically, undoubtedly sarcoma. Syphilis especially was carefully excluded.

I am well aware that these cases are not beyond criticism, especially on the ground of the absence, in some of the cases, of a microscopic examination. This, however, was unavoidable, and in none of the cases, except possibly the last, could there be much real doubt as to the nature of the disease.

In Case IV the long interval which appeared to exist between the last appearance of the disease in the wife and its occurrence in the husband may seem to deprive the case of all significance. When we consider, however, the extremely slow growth of the original tumor, as seen in Mrs. E., and how long a similar one may exist in the abdominal cavity without giving rise to symptoms the objection loses much of its weight. The length of time also that a tumor histologically malignant may remain latent as contrasted with the frequently rapid growth of the same or similar tumors is, I think, not sufficiently appreciated by pathologists, and offers another striking analogy to tubercular deposits. When a tumor which has remained quiescent for many years begins to grow and take on the character of malignancy, surgeons are apt to assume that it has undergone a histological change from a benign to a malignant growth. The following cases tend to prove that at least sometimes the assumption is unwarrantable.

CASE VI. A small tumor, about one half an inch in length by one-fourth of an inch in width, adherent to the skin but situated in the subcutaneous connective tissue, was removed by Dr. Markoe from the back of a healthy man, where it had existed for many years, with, I am informed, little or no change during that time. The tumor is a small round and spindle-celled sarcoma, with little inter-cellular substance, and having histologically all the characters of malignancy.

CASE VII. Minnie M., æt. 19, single, good family history. Noticed a tumor of the neck below the lobe of the left ear three years ago. Tumor is about the size of a pigeon's egg, and resembles a conglomerate of enlarged lymphatics. Patient states that it has scarcely grown or altered since first noticed. Extirpation May 25, 1885. Microscopic examination shows it to be a myxo-sarcoma and histologically very malignant.

CASE VIII. Miss T. Tumor in the same region, precisely similar to the former, occurring in healthy woman, æt. 21. Has existed for five or six years, and grown almost imperceptibly. Patient desires operation only because a brother had died about one year previously of sarcoma of the pharynx. Extirpation by Dr. Sands January 23, 1884. Microscopic examination shows the tumor to be almost exactly similar in structure to the last.

The possibility of direct inoculation of the human subject or of animals with malignant disease has been much discussed, and many experiments made, with generally negative or doubtful results. I have only been able to find in the literature of the subject two at all well authenticated cases of apparent inoculation. Meissner²¹ states that in 104 cases of melanotic sarcoma one patient gave inoculation from a horse with the same disease as the cause. In the discussion on Dr. Formad's paper²² Dr. S. W. Gross quoted from the *Mag. für die Ges. Thierheilkunde*, 1862, p. 328, the case of an ulcerated medullary sarcoma in an ox. A woman who cleaned the sore every day acquired a tumor of the outer side of the fourth finger of the left hand. Kuhn examined the tumor and found it to be a medullary sarcoma. Among cases of supposed contagion which can scarcely be accepted as evidence, Hyverth* refers to cases of contagion reported by Tulp^{ius},† and to those to which have been attributed the deaths of Smith and Bel-linger. In a discussion by Dr. Mundé‡ on cancer of the penis and contagion, the author states that Demarquay, in an analy-

sis of 134 cases, found one where local contagion was alleged, and that Dr. Welch quotes Langenbeck as saying that he had seen three or four cases caused in the same way. Dr. T. Gail-lard Thomas|| states he has only met with one case of cancer of the penis in which contagion seemed to be probable.

There are a great number of unsuccessful or doubtful inoculations of animals, for an account of which I must refer to the general literature given below, and especially to Dr. Formad's article. The only experiments which seem beyond question are those of Professor Klencke,²³ who inoculated a dog in the jugular vein and a horse in the conjunctiva with juice from a pigment carcinoma taken from a mare. In the horse in sixteen weeks the lachrymal gland was transformed into a melanotic tumor; the dog died in three months and melanotic tumor masses were found in the lungs. Novinski²⁴ made 27 inoculations of carcinoma from the nose of a dog into inflamed tissue and 15 into normal skin. All of the first were negative. Two of the last positive. Successful experiment: A small piece of carcinoma (2 mm.) was introduced into a fresh wound of the skin of the back. The wound healed per primam. In 14 days the fragment had reached the size of a pea, in three months, that of a walnut. Four months after the inoculation the dog was killed. The tumor measured three and a half inches in diameter, was soft and white in section. The lymphatic glands in the subclavicular region were much swollen. Microscopic examination of the tumor showed the peripheral part to be made up of closely lying polygonal cells, of epithelial character and varying in size, infiltrating the surrounding connective tissue. In the centre were alveoli of various sizes, with more or less fine tubercles and similar epithelial cells. The same structure occurred in the lymphatic glands.

A young dog was then inoculated with a piece of this tumor, but died half a month later (of pestkrankheit). Examination showed a small tumor at point of inoculation; no metastases. Tumor showed typical cancerous structure. Dr. Gougon (A) gives two cases which do not appear quite so conclusive. He injected melanotic masses into the left thigh of a dog and killed the animal after two weeks. At the point of injection was found a melanotic tumor the size of a thaler, and pigment in

the lymph vessels and neighboring lymphatic glands. The lymphatic glands, including the bronchial, were enlarged and pigmented. Lungs free. The same material was injected into the peritoneal cavity of a second dog, which was killed 43 days later. At point of injection and in the mesentery were deposits of pigment. In one horn of the uterus were two pigmented tumors. Few glands were affected; one much enlarged inguinal gland. The bronchial glands were pigmented, but this was possibly from the lungs. All the pigment was in epithelial cells, but these were not similar to those of the tumor injected.

There is another way, however, of studying the subject. It will not be denied that there is not at present a pathologist of eminence who does not teach that malignant tumors are at first purely local. Could it be shown that carcinoma and sarcoma could be transmitted from man to man or from man to animals, the idea that nothing but the cell was inoculated would not be able to hold its place in scientific opinion for six months. We have passed the stage when it was possible to believe that an infectious disease can be of spontaneous origin. Yet if the disease be at first purely local the inoculation of a distant portion of the body in the same patient, the so-called contact infection is as valuable as the inoculation of another person would be. Cases of this kind are not rare in literature. The chief recorded instances are the following:

Dr. M. Nedopil (O) quotes a case narrated by Lücke of ulcerated carcinoma of the edge of the tongue, with inoculation of the mucous membrane of the cheek on the same side; a case by Kauffmann, in which a woman had cancer of the dorsum of the right hand and subsequently of the conjunctiva of the right eye. Her relatives stated that she constantly wiped the right eye with the back of the right hand. Cases by Ahlfeld, Hegar, and Spiegelberg, of direct inoculation of the vagina from the uterus, and cases by Klebs of inoculation of cancer of the tongue in the stomach. J. Reincke²⁵ gives two cases in which carcinoma developed in the punctures made to relieve ascites due to carcinomatous peritonitis. Prof. H. Quincke²⁶ gives a similar case. C. Bartsch,²⁷ in giving statistics of carcinoma of the lips, penis and vulva relates one case of possible contact infection. P. Kraske²⁸ gives two cases of rectal car-

cinoma in which small secondary tumors were found at a lower point, separated by healthy mucous membrane from the primary growth, and refers to Virchow's (29) well-known observation on the peculiar distribution of carcinoma of the peritoneum secondary to carcinoma of the stomach; to the cases of Lücke³⁰, Kauffmann³¹, and Klebs³² mentioned above, and to a case by Erbse³³, in which a carcinoma of the œsophagus perforated the trachea and gave rise to secondary tumors in the lower lobes of the lungs.

Beck³⁴ records the following three cases from the institute of Chiari, Prague: 1. Ulcerating cancer of œsophagus. In anterior part of lower end of œsophagus and in stomach tumor of the same character—flat epithelial carcinoma. 2. Two carcinomata of the œsophagus separated by healthy tissue. The author admits the possibility of both being primary. 3. Multiple lymphadenoid round-celled sarcoma of most of the lymphatic glands, the lungs, spleen, and posterior surface of the stomach. In the ileum numerous similar nodules, not corresponding to Pyer's patches. In the cœcum an infiltration of almost the whole intestinal wall. The author excludes on various grounds all the other situations, and considers the growth in the cœcum as primary, and the other tumors in the intestinal tract as due to contact infection, the tumor particles being carried back by antiperistalsis; the tumor of the cœcum being ulcerated and having caused much obstruction.

Beck quotes also a case by Hjelt of carcinoma of the ileum and colon with primary cancer of the duodenum.

Two cases of the kind have come under my own observation, as follows:

CASE IX. Mr. A., an elderly gentleman, probably between 50 and 60, suffered for several years from a slowly growing epithelioma of the floor of the mouth on the left side and encroaching on the posterior surface of the gum. Several operations were performed by Dr. Sands at varying intervals, with temporary success, but recurrence after periods varying from two or three years to several months. After the fourth operation, December 18, 1884, rapid recurrence took place. A flat epithelioma developed on the hard palate, first at the point where the tip of the tongue, constantly in contact with the epithelioma in the floor of the mouth, would frequently impinge. The diagnosis in this case was confirmed by repeated microscopic examinations.

CASE X. Mary M., æt. 44, single, March 29, 1885. Family history good. No case of malignant disease known. Carcinoma of right mamma first noticed two years ago. Amputation of breast one year later. Axilla not opened. Recurrence noticed last October. Patient first seen March 29, 1885, suffering from carcinoma, recurrent in cicatrix of operation, the new growth extending as nodular masses, ulcerated in part, over almost the whole of the right side of the thorax, anteriorly, laterally and posteriorly to the external border of the scapula. Axillary glands on the same side much enlarged and the whole right extremity enormously swollen, œdematous and painful. On left side of the thorax, above the mamma, and on the left shoulder, are several isolated, not ulcerated, cancerous nodules, varying in size from that of a split pea to three-fourths of an inch in diameter, and not extending beneath the skin. Profuse sero-purulent discharge from the ulcers. Patient was last seen June 23, 1885, when the carcinoma had extended over the upper part of the abdomen, and a great part of the right scapula and shoulder. Ulceration of the carcinomatous masses in the axilla had occurred. The discharge from the ulcers on the shoulder and in the axilla constantly runs down on the anterior and internal surfaces of the arm and forearm, to the wrist, exciting an eczema and inducing the patient to scratch. *All along this surface are cancerous nodules in the skin, generally ulcerated or excoriated on the surface; some isolated, others confluent, and extending to the wrist.* Died of exhaustion July 10, 1885.

I may mention here one or two more interesting points of analogy between tubercle and malignant tumors. The former appears usually as a more or less chronic and localized disease. It occurs also as an acute infectious disease—acute miliary tuberculosis—involving the different organs with a rapidity that was a complete mystery to the pathologist until the views of Weigert,[†] founded on careful anatomical research, were confirmed by the demonstration by Weichselbaum³⁵, Baumgarten³⁶, and others, of tubercle bacilli in the blood. Raymond and Brodeur³⁷ record a case of primary acute miliary carcinosis, and refer to two similar cases by Charcot. Numerous cases have been reported during the last few years of general tuberculosis following operation on a local process, the operative interference having obviously opened the way for the bacillus into the general circulation³⁸. A precisely similar general cancerous infection has been reported by Dr. Schweninger³⁹ as follows:

Girl, æt. 17, single. Operation for colloid carcinoma of both ovaries. The tumors were punctured shortly before the operation for diagnostic purposes. During the operation one of the tumors was torn. No reaction. Wound practically healed in 10 to 11 days. From this time on a continued fever, of remittent character, diminished power and sensibility in left arm and leg, with severe neuralgic pains and cramps in the affected extremities. Rapid extension of these symptoms to right side, bronchial catarrh, increasing weakness, and death thirty-six days after the operation. Postmortem examination showed that the peritoneum was thickly covered with carcinomatous nodules, varying in size from that of the head of a pin to a pea. Similar nodules in the liver, spleen, beneath the pleura, and in the parenchyma of the lungs, and on the surface of the dura mater. In the interior of the brain was a colloid tumor, about the size of a hen's egg.

Finally, it is with some hesitation that I state that I have found bacilli in a single case of rapidly growing, not ulcerated, large celled sarcoma of the occipital region, occurring in a woman, and extirpated by Dr. Sands during the past year. The tumor tissue had been kept in 95 per cent alcohol since the operation, and the sections were stained with fuchsin by a slight modification of DeGiacomi's ¹⁰ method for staining the bacillus of Lustgarten. The modification consisted merely in more prolonged immersion in the staining fluid and may not have been essential. Every precaution was taken in the way of using sterilized vessels, reagents, etc. Of the two sections examined bacilli were found very sparingly in only one, and after prolonged examination. The examination was made with a Zeiss oil immersion one twelfth and Vêrick eye No. 3, using, of course, the Abbè condenser. Though few in number, the bacilli found were very distinct, only one being situated in each cell, straight, and apparently somewhat longer and plumper in proportion to their length than the tubercle bacilli. I know well, of course, that little or no scientific value attaches to a single observation of the kind by one man, unsupported by the evidence of any others, but mention it because it may acquire some if confirmed by future research, and at least serves to show that my work is not all theoretical, but practical as well.

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